SEQUENCE LISTING

A2

<110>   Hanke, Paul D.

<120>   Feedback-Resistant Pyruvate Carboxylase Gene from *Corynebacterium*

<130>   1533.1230001/MAC/RGM

<140>   US 09/974,973

<141>   2001-10-12

<150>   US 60/239,913

<151>   2000-10-13

<160>   19

<170>   PatentIn version 3.0

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<212>   DNA

<213>   Corynebacterium glutamicum

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1               5                   10                  15

cta gtg tcg act cac aca tct tca acg ctt cca gca ttc aaa aag atc      96
Leu Val Ser Thr His Thr Ser Ser Thr Leu Pro Ala Phe Lys Lys Ile
                20                  25                  30
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ttg gta gca aac cgc ggc gaa atc gcg gtc cgt gct ttc cgt gca gca      144
Leu Val Ala Asn Arg Gly Glu Ile Ala Val Arg Ala Phe Arg Ala Ala
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ctc gaa acc ggt gca gcc acg gta gct att tac ccc cgt gaa gat cgg      192
Leu Glu Thr Gly Ala Ala Thr Val Ala Ile Tyr Pro Arg Glu Asp Arg
        50              55                  60

gga tca ttc cac cgc tct ttt gct tct gaa gct gtc cgc att ggt act      240
Gly Ser Phe His Arg Ser Phe Ala Ser Glu Ala Val Arg Ile Gly Thr
65              70              75                  80

gaa ggc tca cca gtc aag gcg tac ctg gac atc gat gaa att atc ggt      288
Glu Gly Ser Pro Val Lys Ala Tyr Leu Asp Ile Asp Glu Ile Ile Gly
                85              90                  95

gca gct aaa aaa gtt aaa gca gat gct att tac ccg gga tat ggc ttc      336
Ala Ala Lys Lys Val Lys Ala Asp Ala Ile Tyr Pro Gly Tyr Gly Phe
            100             105                 110

ctg tct gaa aat gcc cag ctt gcc cgc gag tgc gcg gaa aac ggc att      384
Leu Ser Glu Asn Ala Gln Leu Ala Arg Glu Cys Ala Glu Asn Gly Ile
        115             120                 125

act ttt att ggc cca acc cca gag gtt ctt gat ctc acc ggt gat aag      432
Thr Phe Ile Gly Pro Thr Pro Glu Val Leu Asp Leu Thr Gly Asp Lys
        130             135                 140

tct cgt gcg gta acc gcc gcg aag aag gct ggt ctg cca gtt ttg gcg      480
Ser Arg Ala Val Thr Ala Ala Lys Lys Ala Gly Leu Pro Val Leu Ala
145             150                 155                 160

gaa tcc acc ccg agc aaa aac atc gat gac atc gtt aaa agc gct gaa      528
Glu Ser Thr Pro Ser Lys Asn Ile Asp Asp Ile Val Lys Ser Ala Glu
                165             170                 175

ggc cag act tac ccc atc ttt gta aag gca gtt gcc ggt ggt ggc gga      576
Gly Gln Thr Tyr Pro Ile Phe Val Lys Ala Val Ala Gly Gly Gly Gly
            180             185                 190

cgc ggt atg cgc ttt gtt tct tca cct gat gag ctc cgc aaa ttg gca      624
Arg Gly Met Arg Phe Val Ser Ser Pro Asp Glu Leu Arg Lys Leu Ala
        195             200                 205

aca gaa gca tct cgt gaa gct gaa gcg gca ttc ggc gac ggt tcg gta      672
Thr Glu Ala Ser Arg Glu Ala Glu Ala Ala Phe Gly Asp Gly Ser Val
        210             215                 220

tat gtc gaa cgt gct gtg att aac ccc cag cac att gaa gtg cag atc      720
Tyr Val Glu Arg Ala Val Ile Asn Pro Gln His Ile Glu Val Gln Ile
225             230                 235                 240

ctt ggc gat cgc act gga gaa gtt gta cac ctt tat gaa cgt gac tgc      768
Leu Gly Asp Arg Thr Gly Glu Val Val His Leu Tyr Glu Arg Asp Cys
                245             250                 255

tca ctg cag cgt cgt cac caa aaa gtt gtc gaa att gcg cca gca cag      816
Ser Leu Gln Arg Arg His Gln Lys Val Val Glu Ile Ala Pro Ala Gln
            260             265                 270

cat ttg gat cca gaa ctg cgt gat cgc att tgt gcg gat gca gta aag      864
His Leu Asp Pro Glu Leu Arg Asp Arg Ile Cys Ala Asp Ala Val Lys
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                275                   280                   285

ttc tgc cgc tcc att ggt tac cag ggc gcg gga acc gtg gaa ttc ttg        912
Phe Cys Arg Ser Ile Gly Tyr Gln Gly Ala Gly Thr Val Glu Phe Leu
    290                 295                 300

gtc gat gaa aag ggc aac cac gtt ttc atc gaa atg aac cca cgt atc        960
Val Asp Glu Lys Gly Asn His Val Phe Ile Glu Met Asn Pro Arg Ile
305                 310                 315                 320

cag gtt gag cac acc gtg act gaa gaa gtc acc gag gtg gac ctg gtg       1008
Gln Val Glu His Thr Val Thr Glu Glu Val Thr Glu Val Asp Leu Val
                325                 330                 335

aag gcg cag atg cgc ttg gct gct ggt gca acc ttg aag gaa ttg ggt       1056
Lys Ala Gln Met Arg Leu Ala Ala Gly Ala Thr Leu Lys Glu Leu Gly
                340                 345                 350

ctg acc caa gat aag atc aag acc cac ggt gca gca ctg cag tgc cgc       1104
Leu Thr Gln Asp Lys Ile Lys Thr His Gly Ala Ala Leu Gln Cys Arg
                355                 360                 365

atc acc acg gaa gat cca aac aac ggc ttc cgc cca gat acc gga act       1152
Ile Thr Thr Glu Asp Pro Asn Asn Gly Phe Arg Pro Asp Thr Gly Thr
    370                 375                 380

atc acc gcg tac cgc tca cca ggc gga gct ggc gtt cgt ctt gac ggt       1200
Ile Thr Ala Tyr Arg Ser Pro Gly Gly Ala Gly Val Arg Leu Asp Gly
385                 390                 395                 400

gca gct cag ctc ggt ggc gaa atc acc gca cac ttt gac tcc atg ctg       1248
Ala Ala Gln Leu Gly Gly Glu Ile Thr Ala His Phe Asp Ser Met Leu
                405                 410                 415

gtg aaa atg acc tgc cgt ggt tcc gac ttt gaa act gct gtt gct cgt       1296
Val Lys Met Thr Cys Arg Gly Ser Asp Phe Glu Thr Ala Val Ala Arg
                420                 425                 430

gca cag cgc gcg ttg gct gag ttc acc gtg tct ggt gtt gca acc aac       1344
Ala Gln Arg Ala Leu Ala Glu Phe Thr Val Ser Gly Val Ala Thr Asn
                435                 440                 445

att ggt ttc ttg cgt gcg ttg ctg cgg gaa gag gac ttc act tcc aag       1392
Ile Gly Phe Leu Arg Ala Leu Leu Arg Glu Glu Asp Phe Thr Ser Lys
    450                 455                 460

cgc atc gcc acc gga ttt atc ggc gat cac cca cac ctc ctt cag gct       1440
Arg Ile Ala Thr Gly Phe Ile Gly Asp His Pro His Leu Leu Gln Ala
465                 470                 475                 480

cca cct gcg gat gat gag cag gga cgc atc ctg gat tac ttg gca gat       1488
Pro Pro Ala Asp Asp Glu Gln Gly Arg Ile Leu Asp Tyr Leu Ala Asp
                485                 490                 495

gtc acc gtg aac aag cct cat ggt gtg cgt cca aag gat gtt gca gca       1536
Val Thr Val Asn Lys Pro His Gly Val Arg Pro Lys Asp Val Ala Ala
                500                 505                 510

cca atc gat aag ctg ccc aac atc aag gat ctg cca ctg cca cgc ggt       1584
Pro Ile Asp Lys Leu Pro Asn Ile Lys Asp Leu Pro Leu Pro Arg Gly
    515                 520                 525
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tcc cgt gac cgc ctg aag cag ctt ggc cca gcc gcg ttt gct cgt gat      1632
Ser Arg Asp Arg Leu Lys Gln Leu Gly Pro Ala Ala Phe Ala Arg Asp
    530                 535                 540

ctc cgt gag cag gac gca ctg gca gtt act gat acc acc ttc cgc gat      1680
Leu Arg Glu Gln Asp Ala Leu Ala Val Thr Asp Thr Thr Phe Arg Asp
545                 550                 555                 560

gca cac cag tct ttg ctt gcg acc cga gtc cgc tca ttc gca ctg aag      1728
Ala His Gln Ser Leu Leu Ala Thr Arg Val Arg Ser Phe Ala Leu Lys
                565                 570                 575

cct gcg gca gag gcc gtc gca aag ctg act cct gag ctt ttg tcc gtg      1776
Pro Ala Ala Glu Ala Val Ala Lys Leu Thr Pro Glu Leu Leu Ser Val
            580                 585                 590

gag gcc tgg ggc ggc gcg acc tac gat gtg gcg atg cgt ttc ctc ttt      1824
Glu Ala Trp Gly Gly Ala Thr Tyr Asp Val Ala Met Arg Phe Leu Phe
            595                 600                 605

gag gat ccg tgg gac agg ctc gac gag ctg cgc gag gcg atg ccg aat      1872
Glu Asp Pro Trp Asp Arg Leu Asp Glu Leu Arg Glu Ala Met Pro Asn
    610                 615                 620

gta aac att cag atg ctg ctt cgc ggc cgc aac acc gtg gga tac acc      1920
Val Asn Ile Gln Met Leu Leu Arg Gly Arg Asn Thr Val Gly Tyr Thr
625                 630                 635                 640

ccg tac cca gac tcc gtc tgc cgc gcg ttt gtt aag gaa gct gcc agc      1968
Pro Tyr Pro Asp Ser Val Cys Arg Ala Phe Val Lys Glu Ala Ala Ser
                645                 650                 655

tcc ggc gtg gac atc ttc cgc atc ttc gac gcg ctt aac gac gtc tcc      2016
Ser Gly Val Asp Ile Phe Arg Ile Phe Asp Ala Leu Asn Asp Val Ser
                660                 665                 670

cag atg cgt cca gca atc gac gca gtc ctg gag acc aac acc gcg gta      2064
Gln Met Arg Pro Ala Ile Asp Ala Val Leu Glu Thr Asn Thr Ala Val
            675                 680                 685

gcc gag gtg gct atg gct tat tct ggt gat ctc tct gat cca aat gaa      2112
Ala Glu Val Ala Met Ala Tyr Ser Gly Asp Leu Ser Asp Pro Asn Glu
    690                 695                 700

aag ctc tac acc ctg gat tac tac cta aag atg gca gag gag atc gtc      2160
Lys Leu Tyr Thr Leu Asp Tyr Tyr Leu Lys Met Ala Glu Glu Ile Val
705                 710                 715                 720

aag tct ggc gct cac att ctg gcc att aag gat atg gct ggt ctg ctt      2208
Lys Ser Gly Ala His Ile Leu Ala Ile Lys Asp Met Ala Gly Leu Leu
                725                 730                 735

cgc cca gct gcg gta acc aag ctg gtc acc gca ctg cgc cgt gaa ttc      2256
Arg Pro Ala Ala Val Thr Lys Leu Val Thr Ala Leu Arg Arg Glu Phe
            740                 745                 750

gat ctg cca gtg cac gtg cac acc cac gac act gcg ggt ggc cag ttg      2304
Asp Leu Pro Val His Val His Thr His Asp Thr Ala Gly Gly Gln Leu
            755                 760                 765

gct acc tac ttt gct gca gct caa gct ggt gca gat gct gtt gac ggt      2352
Ala Thr Tyr Phe Ala Ala Ala Gln Ala Gly Ala Asp Ala Val Asp Gly
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785             790                 795                 800

att gtt gct gca ttc gcg cac acc cgt cgc gat acc ggt ttg agc ctc   2448
Ile Val Ala Ala Phe Ala His Thr Arg Arg Asp Thr Gly Leu Ser Leu
                805                 810                 815

gag gct gtt tct gac ctc gag ccg tac tgg gaa gct gtg cgc gga ctg   2496
Glu Ala Val Ser Asp Leu Glu Pro Tyr Trp Glu Ala Val Arg Gly Leu
            820                 825                 830

tac ctg cca ttt gag tct gga acc cca ggc cca acc ggt cgc gtc tac   2544
Tyr Leu Pro Phe Glu Ser Gly Thr Pro Gly Pro Thr Gly Arg Val Tyr
            835                 840                 845

cgc cac gaa atc cca ggc gga cag ttg tcc aac ctg cgt gca cag gcc   2592
Arg His Glu Ile Pro Gly Gly Gln Leu Ser Asn Leu Arg Ala Gln Ala
        850                 855                 860

acc gca ctg ggc ctt gct gat cgc ttc gag ctc atc gaa gac aac tac   2640
Thr Ala Leu Gly Leu Ala Asp Arg Phe Glu Leu Ile Glu Asp Asn Tyr
865             870                 875                 880

gca gcc gtt aat gag atg ctg gga cgc cca acc aag gtc acc cca tcc   2688
Ala Ala Val Asn Glu Met Leu Gly Arg Pro Thr Lys Val Thr Pro Ser
                885                 890                 895

tcc aag gtt gtt ggc gac ctc gca ctc cac ctg gtt ggt gcg ggt gta   2736
Ser Lys Val Val Gly Asp Leu Ala Leu His Leu Val Gly Ala Gly Val
            900                 905                 910

gat cca gca gac ttt gct gca gac cca caa aag tac gac atc cca gac   2784
Asp Pro Ala Asp Phe Ala Ala Asp Pro Gln Lys Tyr Asp Ile Pro Asp
            915                 920                 925

tct gtc atc gcg ttc ctg cgc ggc gag ctt ggt aac cct cca ggt ggc   2832
Ser Val Ile Ala Phe Leu Arg Gly Glu Leu Gly Asn Pro Pro Gly Gly
        930                 935                 940

tgg cca gaa cca ctg cgc acc cgc gca ctg gaa ggc cgc tcc gaa ggc   2880
Trp Pro Glu Pro Leu Arg Thr Arg Ala Leu Glu Gly Arg Ser Glu Gly
945             950                 955                 960

aag gca cct ctg acg gaa gtt cct gag gaa gag cag gcg cac ctc gac   2928
Lys Ala Pro Leu Thr Glu Val Pro Glu Glu Glu Gln Ala His Leu Asp
                965                 970                 975

gct gat gat tcc aag gaa cgt cgc aac agc ctc aac cgc ctg ctg ttc   2976
Ala Asp Asp Ser Lys Glu Arg Arg Asn Ser Leu Asn Arg Leu Leu Phe
            980                 985                 990

ccg aag cca acc gaa gag ttc ctc  gag cac cgt cgc cgc  ttc ggc aac   3024
Pro Lys Pro Thr Glu Glu Phe Leu  Glu His Arg Arg Arg  Phe Gly Asn
            995                 1000                1005

acc tct  gcg ctg gat gat cgt  gaa ttc ttc tac gga  ctg gtc gag   3069
Thr Ser  Ala Leu Asp Asp Arg  Glu Phe Phe Tyr Gly  Leu Val Glu
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ggc cgc  gag act ttg atc cgc  ctg cca gat gtg cgc  acc cca ctg        3114
Gly Arg  Glu Thr Leu Ile Arg  Leu Pro Asp Val Arg  Thr Pro Leu
    1025             1030              1035

ctt gtt  cgc ctg gat gcg atc  tct gag cca gac gat  aag ggt atg        3159
Leu Val  Arg Leu Asp Ala Ile  Ser Glu Pro Asp Asp  Lys Gly Met
    1040             1045              1050

cgc aat  gtt gtg gcc aac gtc  aac ggc cag atc cgc  cca atg cgt        3204
Arg Asn  Val Val Ala Asn Val  Asn Gly Gln Ile Arg  Pro Met Arg
    1055             1060              1065

gtg cgt  gac cgc tcc gtt gag  tct gtc acc gca acc  gca gaa aag        3249
Val Arg  Asp Arg Ser Val Glu  Ser Val Thr Ala Thr  Ala Glu Lys
    1070             1075              1080

gca gat  tcc tcc aac aag ggc  cat gtt gct gca cca  ttc gct ggt        3294
Ala Asp  Ser Ser Asn Lys Gly  His Val Ala Ala Pro  Phe Ala Gly
    1085             1090              1095

gtt gtc  act gtg act gtt gct  gaa ggt gat gag gtc  aag gct gga        3339
Val Val  Thr Val Thr Val Ala  Glu Gly Asp Glu Val  Lys Ala Gly
    1100             1105              1110

gat gca  gtc gca atc atc gag  gct atg aag atg gaa  gca aca atc        3384
Asp Ala  Val Ala Ile Ile Glu  Ala Met Lys Met Glu  Ala Thr Ile
    1115             1120              1125

act gct  tct gtt gac ggc aag  att gaa cgc gtt gtg  gtt cct gct        3429
Thr Ala  Ser Val Asp Gly Lys  Ile Glu Arg Val Val  Val Pro Ala
    1130             1135              1140

gca acg  aag gtg gaa ggt ggc  gac ttg atc gtc gtc  gtt tcc taa        3474
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Leu Val Ala Asn Arg Gly Glu Ile Ala Val Arg Ala Phe Arg Ala Ala
        35              40              45


Leu Glu Thr Gly Ala Ala Thr Val Ala Ile Tyr Pro Arg Glu Asp Arg
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        50                        55                        60

Gly Ser Phe His Arg Ser Phe Ala Ser Glu Ala Val Arg Ile Gly Thr
65                      70                  75                  80


Glu Gly Ser Pro Val Lys Ala Tyr Leu Asp Ile Asp Glu Ile Ile Gly
                85                  90                  95


Ala Ala Lys Lys Val Lys Ala Asp Ala Ile Tyr Pro Gly Tyr Gly Phe
            100                 105                 110


Leu Ser Glu Asn Ala Gln Leu Ala Arg Glu Cys Ala Glu Asn Gly Ile
            115                 120                 125


Thr Phe Ile Gly Pro Thr Pro Glu Val Leu Asp Leu Thr Gly Asp Lys
    130                 135                 140


Ser Arg Ala Val Thr Ala Ala Lys Lys Ala Gly Leu Pro Val Leu Ala
145                 150                 155                 160


Glu Ser Thr Pro Ser Lys Asn Ile Asp Asp Ile Val Lys Ser Ala Glu
                165                 170                 175


Gly Gln Thr Tyr Pro Ile Phe Val Lys Ala Val Ala Gly Gly Gly Gly
            180                 185                 190


Arg Gly Met Arg Phe Val Ser Ser Pro Asp Glu Leu Arg Lys Leu Ala
            195                 200                 205


Thr Glu Ala Ser Arg Glu Ala Glu Ala Ala Phe Gly Asp Gly Ser Val
    210                 215                 220


Tyr Val Glu Arg Ala Val Ile Asn Pro Gln His Ile Glu Val Gln Ile
225                 230                 235                 240


Leu Gly Asp Arg Thr Gly Glu Val Val His Leu Tyr Glu Arg Asp Cys
            245                 250                 255


Ser Leu Gln Arg Arg His Gln Lys Val Val Glu Ile Ala Pro Ala Gln
            260                 265                 270


His Leu Asp Pro Glu Leu Arg Asp Arg Ile Cys Ala Asp Ala Val Lys
            275                 280                 285


Phe Cys Arg Ser Ile Gly Tyr Gln Gly Ala Gly Thr Val Glu Phe Leu
    290                 295                 300
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Val Asp Glu Lys Gly Asn His Val Phe Ile Glu Met Asn Pro Arg Ile
305   310   315   320

Gln Val Glu His Thr Val Thr Glu Glu Val Thr Glu Val Asp Leu Val
                325   330   335

Lys Ala Gln Met Arg Leu Ala Ala Gly Ala Thr Leu Lys Glu Leu Gly
                340   345   350

Leu Thr Gln Asp Lys Ile Lys Thr His Gly Ala Ala Leu Gln Cys Arg
                355   360   365

Ile Thr Thr Glu Asp Pro Asn Asn Gly Phe Arg Pro Asp Thr Gly Thr
    370   375   380

Ile Thr Ala Tyr Arg Ser Pro Gly Gly Ala Gly Val Arg Leu Asp Gly
385   390   395   400

Ala Ala Gln Leu Gly Gly Glu Ile Thr Ala His Phe Asp Ser Met Leu
                405   410   415

Val Lys Met Thr Cys Arg Gly Ser Asp Phe Glu Thr Ala Val Ala Arg
                420   425   430

Ala Gln Arg Ala Leu Ala Glu Phe Thr Val Ser Gly Val Ala Thr Asn
                435   440   445

Ile Gly Phe Leu Arg Ala Leu Leu Arg Glu Glu Asp Phe Thr Ser Lys
    450   455   460

Arg Ile Ala Thr Gly Phe Ile Gly Asp His Pro His Leu Leu Gln Ala
465   470   475   480

Pro Pro Ala Asp Asp Glu Gln Gly Arg Ile Leu Asp Tyr Leu Ala Asp
                485   490   495

Val Thr Val Asn Lys Pro His Gly Val Arg Pro Lys Asp Val Ala Ala
                500   505   510

Pro Ile Asp Lys Leu Pro Asn Ile Lys Asp Leu Pro Leu Pro Arg Gly
                515   520   525

Ser Arg Asp Arg Leu Lys Gln Leu Gly Pro Ala Ala Phe Ala Arg Asp
    530   535   540

Leu Arg Glu Gln Asp Ala Leu Ala Val Thr Asp Thr Thr Phe Arg Asp
545   550   555   560

Ala His Gln Ser Leu Leu Ala Thr Arg Val Arg Ser Phe Ala Leu Lys
             565   570   575

Pro Ala Ala Glu Ala Val Ala Lys Leu Thr Pro Glu Leu Leu Ser Val
             580   585   590

Glu Ala Trp Gly Gly Ala Thr Tyr Asp Val Ala Met Arg Phe Leu Phe
             595   600   605

Glu Asp Pro Trp Asp Arg Leu Asp Glu Leu Arg Glu Ala Met Pro Asn
             610   615   620

Val Asn Ile Gln Met Leu Leu Arg Gly Arg Asn Thr Val Gly Tyr Thr
625   630   635   640

Pro Tyr Pro Asp Ser Val Cys Arg Ala Phe Val Lys Glu Ala Ala Ser
             645   650   655

Ser Gly Val Asp Ile Phe Arg Ile Phe Asp Ala Leu Asn Asp Val Ser
             660   665   670

Gln Met Arg Pro Ala Ile Asp Ala Val Leu Glu Thr Asn Thr Ala Val
             675   680   685

Ala Glu Val Ala Met Ala Tyr Ser Gly Asp Leu Ser Asp Pro Asn Glu
             690   695   700

Lys Leu Tyr Thr Leu Asp Tyr Tyr Leu Lys Met Ala Glu Glu Ile Val
705   710   715   720

Lys Ser Gly Ala His Ile Leu Ala Ile Lys Asp Met Ala Gly Leu Leu
             725   730   735

Arg Pro Ala Ala Val Thr Lys Leu Val Thr Ala Leu Arg Arg Glu Phe
             740   745   750

Asp Leu Pro Val His Val His Thr His Asp Thr Ala Gly Gly Gln Leu
             755   760   765

Ala Thr Tyr Phe Ala Ala Ala Gln Ala Gly Ala Asp Ala Val Asp Gly
785   770   775   780

Ala Ser Ala Pro Leu Ser Gly Thr Thr Ser Gln Pro Ser Leu Ser Ala
785   790   795   800

Ile Val Ala Ala Phe Ala His Thr Arg Arg Asp Thr Gly Leu Ser Leu

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                805                      810                      815

Glu Ala Val Ser Asp Leu Glu Pro Tyr Trp Glu Ala Val Arg Gly Leu
            820             825             830

Tyr Leu Pro Phe Glu Ser Gly Thr Pro Gly Pro Thr Gly Arg Val Tyr
            835             840             845

Arg His Glu Ile Pro Gly Gly Gln Leu Ser Asn Leu Arg Ala Gln Ala
    850             855             860

Thr Ala Leu Gly Leu Ala Asp Arg Phe Glu Leu Ile Glu Asp Asn Tyr
865             870             875             880

Ala Ala Val Asn Glu Met Leu Gly Arg Pro Thr Lys Val Thr Pro Ser
            885             890             895

Ser Lys Val Val Gly Asp Leu Ala Leu His Leu Val Gly Ala Gly Val
            900             905             910

Asp Pro Ala Asp Phe Ala Ala Asp Pro Gln Lys Tyr Asp Ile Pro Asp
            915             920             925

Ser Val Ile Ala Phe Leu Arg Gly Glu Leu Gly Asn Pro Pro Gly Gly
    930             935             940

Trp Pro Glu Pro Leu Arg Thr Arg Ala Leu Glu Gly Arg Ser Glu Gly
945             950             955             960

Lys Ala Pro Leu Thr Glu Val Pro Glu Glu Glu Gln Ala His Leu Asp
            965             970             975

Ala Asp Asp Ser Lys Glu Arg Arg Asn Ser Leu Asn Arg Leu Leu Phe
            980             985             990

Pro Lys Pro Thr Glu Glu Phe Leu  Glu His Arg Arg Arg  Phe Gly Asn
            995            1000            1005

Thr Ser  Ala Leu Asp Asp Arg  Glu Phe Phe Tyr Gly  Leu Val Glu
    1010            1015            1020

Gly Arg  Glu Thr Leu Ile Arg  Leu Pro Asp Val Arg  Thr Pro Leu
    1025            1030            1035

Leu Val  Arg Leu Asp Ala Ile  Ser Glu Pro Asp Asp  Lys Gly Met
    1040            1045            1050
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Arg Asn  Val Val Ala Asn Val  Asn Gly Gln Ile Arg  Pro Met Arg
    1055             1060             1065


Val Arg  Asp Arg Ser Val Glu  Ser Val Thr Ala Thr  Ala Glu Lys
    1070             1075             1080


Ala Asp  Ser Ser Asn Lys Gly  His Val Ala Ala Pro  Phe Ala Gly
    1085             1090             1095


Val Val  Thr Val Thr Val Ala  Glu Gly Asp Glu Val  Lys Ala Gly
    1100             1105             1110


Asp Ala  Val Ala Ile Ile Glu  Ala Met Lys Met Glu  Ala Thr Ile
    1115             1120             1125


Thr Ala  Ser Val Asp Gly Lys  Ile Glu Arg Val Val  Val Pro Ala
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Ala Thr  Lys Val Glu Gly Gly  Asp Leu Ile Val Val  Val Ser
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<212> DNA

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gcggtccgtg ctttccgtgc agcactcgaa accggtgcag ccacggtagc tatttacccc  180
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cgcatttgtg cggatgcagt aaagttctgc cgctccattg gttaccaggg cgcgggaacc      900

gtggaattct tggtcgatga aaagggcaac cacgttttca tcgaaatgaa cccacgtatc      960

caggttgagc acaccgtgac tgaagaagtc accgaggtgg acctggtgaa ggcgcagatg     1020

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tgccgtggtt ccgactttga aactgctgtt gctcgtgcac agcgcgcgtt ggctgagttc     1320

accgtgtctg gtgttgcaac caacattggt ttcttgcgtg cgttgctgcg ggaagaggac     1380

ttcacttcca agcgcatcgc caccggattt atcggcgatc acccacacct ccttcaggct     1440

ccacctgcgg atgatgagca gggacgcatc ctggattact tggcagatgt caccgtgaac     1500

aagcctcatg gtgtgcgtcc aaaggatgtt gcagcaccaa tcgataagct gcccaacatc     1560

aaggatctgc cactgccacg cggttcccgt gaccgcctga agcagcttgg cccagccgcg     1620

tttgctcgtg atctccgtga gcaggacgca ctggcagtta ctgataccac cttccgcgat     1680

gcacaccagt cttttgcttgc gacccgagtc cgctcattcg cactgaagcc tgcggcagag     1740

gccgtcgcaa agctgactcc tgagcttttg tccgtggagg cctggggcgg cgcgacctac     1800

gatgtggcga tgcgtttcct cttttgaggat ccgtgggaca ggctcgacga gctgcgcgag     1860

gcgatgccga atgtaaacat tcagatgctg cttcgcggcc gcaacaccgt gggatacacc     1920

ccgtacccag actccgtctg ccgcgcgttt gttaaggaag ctgccagctc cggcgtggac     1980

atcttccgca tcttcgacgc gcttaacgac gtctcccaga tgcgtccagc aatcgacgca     2040

gtcctggaga ccaacaccgc ggtagccgag gtggctatgg cttattctgg tgatctctct     2100

gatccaaatg aaaagctcta caccctggat tactacctaa agatggcaga ggagatcgtc     2160

aagtctggcg ctcacattct ggccattaag gatatggctg gtctgcttcg cccagctgcg     2220

gtaaccaagc tggtcaccgc actgcgccgt gaattcgatc tgccagtgca cgtgcacacc     2280

cacgacactg cgggtggcca gttggctacc tactttgctg cagctcaagc tggtgcagat     2340

gctgttgacg gtgcttccgc accactgtct ggcaccacct cccagccatc cctgtctgcc     2400

attgttgctg cattcgcgca cacccgtcgc gataccggtt tgagcctcga ggctgtttct     2460

gacctcgagc cgtactggga agctgtgcgc ggactgtacc tgccatttga gtctggaacc     2520

ccaggcccaa ccggtcgcgt ctaccgccac gaaatcccag gcggacagtt gtccaacctg     2580
```

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cgtgcacagg ccaccgcact gggccttgct gatcgcttcg agctcatcga agacaactac    2640

gcagccgtta atgagatgct gggacgccca accaaggtca ccccatcctc caaggttgtt    2700

ggcgacctcg cactccacct ggttggtgcg ggtgtagatc cagcagactt tgctgcagac    2760

ccacaaaagt acgacatccc agactctgtc atcgcgttcc tgcgcggcga gcttggtaac    2820

cctccaggtg ctggccagaa ccactgcgc acccgcgcac tggaaggccg ctccgaaggc    2880

aaggcacctc tgacggaagt tcctgaggaa gagcaggcgc acctcgacgc tgatgattcc    2940

aaggaacgtc gcaacagcct caaccgcctg ctgttcccga gccaaccga agagttcctc    3000

gagcaccgtc gccgcttcgg caacacctct gcgctggatg atcgtgaatt cttctacgga    3060

ctggtcgagg gccgcgagac tttgatccgc ctgccagatg tgcgcacccc actgcttgtt    3120

cgcctggatg cgatctctga gccagacgat aagggtatgc gcaatgttgt ggccaacgtc    3180

aacggccaga tccgcccaat gcgtgtgcgt gaccgctccg ttgagtctgt caccgcaacc    3240

gcagaaaagg cagattcctc aacaagggc catgttgctg caccattcgc tggtgttgtc    3300

actgtgactg ttgctgaagg tgatgaggtc aaggctggag atgcagtcgc aatcatcgag    3360

gctatgaaga tggaagcaac aatcactgct tctgttgacg caagattga acgcgttgtg    3420

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<211>   1157

<212>   PRT

<213>   Corynebacterium glutamicum

<400>   4

Met Thr Ala Ile Thr Leu Gly Gly Leu Leu Leu Lys Gly Ile Ile Thr
1   5   10   15

Leu Val Ser Thr His Thr Ser Ser Thr Leu Pro Ala Phe Lys Lys Ile
            20   25   30

Leu Val Ala Asn Arg Gly Glu Ile Ala Val Arg Ala Phe Arg Ala Ala
            35   40   45

Leu Glu Thr Gly Ala Ala Thr Val Ala Ile Tyr Pro Arg Glu Asp Arg
    50   55   60

Gly Ser Phe His Arg Ser Phe Ala Ser Glu Ala Val Arg Ile Gly Thr
65   70   75   80

Glu Gly Ser Pro Val Lys Ala Tyr Leu Asp Ile Asp Glu Ile Ile Gly
                85   90   95

Ala Ala Lys Lys Val Lys Ala Asp Ala Ile Tyr Pro Gly Tyr Gly Phe

```
                100                        105                        110

Leu Ser Glu Asn Ala Gln Leu Ala Arg Glu Cys Ala Glu Asn Gly Ile
        115                 120             125

Thr Phe Ile Gly Pro Thr Pro Glu Val Leu Asp Leu Thr Gly Asp Lys
    130             135             140

Ser Arg Ala Val Thr Ala Ala Lys Lys Ala Gly Leu Pro Val Leu Ala
145             150             155             160

Glu Ser Thr Pro Ser Lys Asn Ile Asp Asp Ile Val Lys Ser Ala Glu
                165             170             175

Gly Gln Thr Tyr Pro Ile Phe Val Lys Ala Val Ala Gly Gly Gly Gly
            180             185             190

Arg Gly Met Arg Phe Val Ser Ser Pro Asp Glu Leu Arg Lys Leu Ala
        195             200             205

Thr Glu Ala Ser Arg Glu Ala Glu Ala Ala Phe Gly Asp Gly Ser Val
    210             215             220

Tyr Val Glu Arg Ala Val Ile Asn Pro Gln His Ile Glu Val Gln Ile
225             230             235             240

Leu Gly Asp Arg Thr Gly Glu Val Val His Leu Tyr Glu Arg Asp Cys
            245             250             255

Ser Leu Gln Arg Arg His Gln Lys Val Val Glu Ile Ala Pro Ala Gln
        260             265             270

His Leu Asp Pro Glu Leu Arg Asp Arg Ile Cys Ala Asp Ala Val Lys
        275             280             285

Phe Cys Arg Ser Ile Gly Tyr Gln Gly Ala Gly Thr Val Glu Phe Leu
    290             295             300

Val Asp Glu Lys Gly Asn His Val Phe Ile Glu Met Asn Pro Arg Ile
305             310             315             320

Gln Val Glu His Thr Val Thr Glu Glu Val Thr Glu Val Asp Leu Val
            325             330             335

Lys Ala Gln Met Arg Leu Ala Ala Gly Ala Thr Leu Lys Glu Leu Gly
            340             345             350

Leu Thr Gln Asp Lys Ile Lys Thr His Gly Ala Ala Leu Gln Cys Arg
        355             360             365

Ile Thr Thr Glu Asp Pro Asn Asn Gly Phe Arg Pro Asp Thr Gly Thr
    370             375             380

Ile Thr Ala Tyr Arg Ser Pro Gly Gly Ala Gly Val Arg Leu Asp Gly
385             390             395             400

Ala Ala Gln Leu Gly Gly Glu Ile Thr Ala His Phe Asp Ser Met Leu
            405             410             415

Val Lys Met Thr Cys Arg Gly Ser Asp Phe Glu Thr Ala Val Ala Arg
        420             425             430
```

```
Ala Gln Arg Ala Leu Ala Glu Phe Thr Val Ser Gly Val Ala Thr Asn
        435                 440             445

Ile Gly Phe Leu Arg Ala Leu Leu Arg Glu Glu Asp Phe Thr Ser Lys
        450             455             460

Arg Ile Ala Thr Gly Phe Ile Gly Asp His Pro His Leu Leu Gln Ala
465             470             475                 480

Pro Pro Ala Asp Asp Glu Gln Gly Arg Ile Leu Asp Tyr Leu Ala Asp
            485             490             495

Val Thr Val Asn Lys Pro His Gly Val Arg Pro Lys Asp Val Ala Ala
        500             505             510

Pro Ile Asp Lys Leu Pro Asn Ile Lys Asp Leu Pro Leu Pro Arg Gly
        515             520             525

Ser Arg Asp Arg Leu Lys Gln Leu Gly Pro Ala Ala Phe Ala Arg Asp
    530             535                 540

Leu Arg Glu Gln Asp Ala Leu Ala Val Thr Asp Thr Thr Phe Arg Asp
545             550             555             560

Ala His Gln Ser Leu Leu Ala Thr Arg Val Arg Ser Phe Ala Leu Lys
            565             570             575

Pro Ala Ala Glu Ala Val Ala Lys Leu Thr Pro Glu Leu Leu Ser Val
        580             585             590

Glu Ala Trp Gly Gly Ala Thr Tyr Asp Val Ala Met Arg Phe Leu Phe
        595             600             605

Glu Asp Pro Trp Asp Arg Leu Asp Glu Leu Arg Glu Ala Met Pro Asn
    610             615             620

Val Asn Ile Gln Met Leu Leu Arg Gly Arg Asn Thr Val Gly Tyr Thr
625             630             635             640

Pro Tyr Pro Asp Ser Val Cys Arg Ala Phe Val Lys Glu Ala Ala Ser
            645             650             ·655

Ser Gly Val Asp Ile Phe Arg Ile Phe Asp Ala Leu Asn Asp Val Ser
            660             665             670

Gln Met Arg Pro Ala Ile Asp Ala Val Leu Glu Thr Asn Thr Ala Val
        675             680             685

Ala Glu Val Ala Met Ala Tyr Ser Gly Asp Leu Ser Asp Pro Asn Glu
        690             695             700

Lys Leu Tyr Thr Leu Asp Tyr Tyr Leu Lys Met Ala Glu Glu Ile Val
705             710             715             720

Lys Ser Gly Ala His Ile Leu Ala Ile Lys Asp Met Ala Gly Leu Leu
            725             730             735

Arg Pro Ala Ala Val Thr Lys Leu Val Thr Ala Leu Arg Arg Glu Phe
        740             745             750

Asp Leu Pro Val His Val His Thr His Asp Thr Ala Gly Gly Gln Leu
        755             760             765
```

```
Ala Thr Tyr Phe Ala Ala Ala Gln Ala Gly Ala Asp Ala Val Asp Gly
    770             775             780
```

```
Ala Ser Ala Pro Leu Ser Gly Thr Thr Ser Gln Pro Ser Leu Ser Ala
785             790             795             800
```

```
Ile Val Ala Ala Phe Ala His Thr Arg Arg Asp Thr Gly Leu Ser Leu
            805             810             815
```

```
Glu Ala Val Ser Asp Leu Glu Pro Tyr Trp Glu Ala Val Arg Gly Leu
        820             825             830
```

```
Tyr Leu Pro Phe Glu Ser Gly Thr Pro Gly Pro Thr Gly Arg Val Tyr
    835             840             845
```

```
Arg His Glu Ile Pro Gly Gly Gln Leu Ser Asn Leu Arg Ala Gln Ala
    850             855             860
```

```
Thr Ala Leu Gly Leu Ala Asp Arg Phe Glu Leu Ile Glu Asp Asn Tyr
865             870             875             880
```

```
Ala Ala Val Asn Glu Met Leu Gly Arg Pro Thr Lys Val Thr Pro Ser
            885             890             895
```

```
Ser Lys Val Val Gly Asp Leu Ala Leu His Leu Val Gly Ala Gly Val
        900             905             910
```

```
Asp Pro Ala Asp Phe Ala Ala Asp Pro Gln Lys Tyr Asp Ile Pro Asp
    915             920             925
```

```
Ser Val Ile Ala Phe Leu Arg Gly Glu Leu Gly Asn Pro Pro Gly Gly
    930             935             940
```

```
Trp Pro Glu Pro Leu Arg Thr Arg Ala Leu Glu Gly Arg Ser Glu Gly
945             950             955             960
```

```
Lys Ala Pro Leu Thr Glu Val Pro Glu Glu Glu Gln Ala His Leu Asp
            965             970             975
```

```
Ala Asp Asp Ser Lys Glu Arg Arg Asn Ser Leu Asn Arg Leu Leu Phe
            980             985             990
```

```
Pro Lys Pro Thr Glu Glu Phe Leu  Glu His Arg Arg Arg  Phe Gly Asn
    995             1000            1005
```

```
Thr Ser  Ala Leu Asp Asp Arg  Glu Phe Phe Tyr Gly  Leu Val Glu
    1010            1015            1020
```

```
Gly Arg  Glu Thr Leu Ile Arg  Leu Pro Asp Val Arg  Thr Pro Leu
    1025            1030            1035
```

```
Leu Val  Arg Leu Asp Ala Ile  Ser Glu Pro Asp Asp  Lys Gly Met
    1040            1045            1050
```

```
Arg Asn  Val Val Ala Asn Val  Asn Gly Gln Ile Arg  Pro Met Arg
    1055            1060            1065
```

```
Val Arg  Asp Arg Ser Val Glu  Ser Val Thr Ala Thr  Ala Glu Lys
    1070            1075            1080
```

```
Ala Asp  Ser Ser Asn Lys Gly  His Val Ala Ala Pro  Phe Ala Gly
    1085            1090            1095
```

Val Val Thr Val Thr Val Ala Glu Gly Asp Glu Val Lys Ala Gly
    1100   1105   1110

Asp Ala Val Ala Ile Ile Glu Ala Met Lys Met Glu Ala Thr Ile
    1115   1120   1125

Thr Ala Ser Val Asp Gly Lys Ile Glu Arg Val Val Val Pro Ala
    1130   1135   1140

Ala Thr Lys Val Glu Gly Gly Asp Leu Ile Val Val Val Ser
    1145   1150   1155

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<211> 39

<212> DNA

<213> Corynebacterium glutamicum

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<210> 6

<211> 13

<212> PRT

<213> Corynebacterium glutamicum

<400> 6

Pro Ser Lys Asn Ile Asp Asp Ile Val Lys Ser Ala Glu
1   5   10

<210> 7

<211> 39

<212> DNA

<213> Corynebacterium glutamicum

<400> 7
cgcggtatgc gctttgtttc ttcacctgat gagctccgc   39

<210> 8

<211> 13

<212> PRT

<213> Corynebacterium glutamicum

<400> 8

Arg Gly Met Arg Phe Val Ser Ser Pro Asp Glu Leu Arg
1   5   10

<210>   9

<211>   39

<212>   DNA

<213>   Corynebacterium glutamicum

<400>   9
gcggcattcg gcgacggttc ggtatatgtc gaacgtgct   39

<210>   10

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<212>   PRT

<213>   Corynebacterium glutamicum

<400>   10

Ala Ala Phe Gly Asp Gly Ser Val Tyr Val Glu Arg Ala
1   5   10

<210>   11

<211>   39

<212>   DNA

<213>   Corynebacterium glutamicum

<400>   11
gtgcagatcc ttggcgatcg cactggagaa gttgtacac   39

<210>   12

<211>   13

<212>   PRT

<213>   Corynebacterium glutamicum

<400>   12

Val Gln Ile Leu Gly Asp Arg Thr Gly Glu Val Val His
1   5   10

<210>   13

<211>   39

<212>   DNA

<213>   Corynebacterium glutamicum

<400>   13
atcgccaccg gatttatcgg cgatcaccca cacctcctt   39

<210>   14

<211>   13

<212>   PRT

<213>   Corynebacterium glutamicum

<400>   14

Ile Ala Thr Gly Phe Ile Gly Asp His Pro His Leu Leu
1   5   10

<210>   15

<211>   39

<212>   DNA

<213>   Corynebacterium glutamicum

<400>   15
acaatcactg cttctgttga cggcaagatt gaacgcgtt   39

<210>   16

<211>   13

<212>   PRT

<213>   Corynebacterium glutamicum

<400>   16

Thr Ile Thr Ala Ser Val Asp Gly Lys Ile Glu Arg Val
1   5   10

<210>   17

<211> 54

<212> DNA

<213> Corynebacterium glutamicum

<400> 17
gtgactgcta tcacccttgg cggtctcttg ttgaaaggaa taattactct agtg   54

<210> 18

<211> 18

<212> PRT

<213> Corynebacterium glutamicum

<400> 18

Met Thr Ala Ile Thr Leu Gly Gly Leu Leu Leu Lys Gly Ile Ile Thr
1   5   10   15

Leu Val

<210> 19

<211> 1140

<212> PRT

<213> Corynebacterium glutamicum

<400> 19

Met Ser Thr His Thr Ser Ser Thr Leu Pro Ala Phe Lys Lys Ile Leu
1   5   10   15

Val Ala Asn Arg Gly Glu Ile Ala Val Arg Ala Phe Arg Ala Ala Leu
            20   25   30

Glu Thr Gly Ala Ala Thr Val Ala Ile Tyr Pro Arg Glu Asp Arg Gly
        35   40   45

Ser Phe His Arg Ser Phe Ala Ser Glu Ala Val Arg Ile Gly Thr Glu
    50   55   60

Gly Ser Pro Val Lys Ala Tyr Leu Asp Ile Asp Glu Ile Ile Gly Ala
65   70   75   80

Ala Lys Lys Val Lys Ala Asp Ala Ile Tyr Pro Gly Tyr Gly Phe Leu
                85   90   95

Ser Glu Asn Ala Gln Leu Ala Arg Glu Cys Ala Glu Asn Gly Ile Thr
            100   105   110

Phe Ile Gly Pro Thr Pro Glu Val Leu Asp Leu Thr Gly Asp Lys Ser
        115   120   125

Arg Ala Val Thr Ala Ala Lys Lys Ala Gly Leu Pro Val Leu Ala Glu
    130   135   140

Ser Thr Pro Ser Lys Asn Ile Asp Glu Ile Val Lys Ser Ala Glu Gly
145   150   155   160

Gln Thr Tyr Pro Ile Phe Val Lys Ala Val Ala Gly Gly Gly Gly Arg
            165   170   175

Gly Met Arg Phe Val Ala Ser Pro Asp Glu Leu Arg Lys Leu Ala Thr
        180   185   190

Glu Ala Ser Arg Glu Ala Glu Ala Ala Phe Gly Asp Gly Ala Val Tyr
        195   200   205

Val Glu Arg Ala Val Ile Asn Pro Gln His Ile Glu Val Gln Ile Leu
    210   215   220

Gly Asp His Thr Gly Glu Val Val His Leu Tyr Glu Arg Asp Cys Ser
225   230   235   240

Leu Gln Arg Arg His Gln Lys Val Val Glu Ile Ala Pro Ala Gln His
            245   250   255

Leu Asp Pro Glu Leu Arg Asp Arg Ile Cys Ala Asp Ala Val Lys Phe
            260   265   270

Cys Arg Ser Ile Gly Tyr Gln Gly Ala Gly Thr Val Glu Phe Leu Val
        275   280   285

Asp Glu Lys Gly Asn His Val Phe Ile Glu Met Asn Pro Arg Ile Gln
    290   295   300

Val Glu His Thr Val Thr Glu Glu Val Thr Glu Val Asp Leu Val Lys
305   310   315   320

Ala Gln Met Arg Leu Ala Ala Gly Ala Thr Leu Lys Glu Leu Gly Leu
        325   330   335

Thr Gln Asp Lys Ile Lys Thr His Gly Ala Ala Leu Gln Cys Arg Ile
        340   345   350

Thr Thr Glu Asp Pro Asn Asn Gly Phe Arg Pro Asp Thr Gly Thr Ile
        355   360   365

Thr Ala Tyr Arg Ser Pro Gly Gly Ala Gly Val Arg Leu Asp Gly Ala
    370   375   380

Ala Gln Leu Gly Gly Glu Ile Thr Ala His Phe Asp Ser Met Leu Val
385   390   395   400

Lys Met Thr Cys Arg Gly Ser Asp Phe Glu Thr Ala Val Ala Arg Ala
            405   410   415

Gln Arg Ala Leu Ala Glu Phe Thr Val Ser Gly Val Ala Thr Asn Ile
        420   425   430

Gly Phe Leu Arg Ala Leu Leu Arg Glu Glu Asp Phe Thr Ser Lys Arg
        435   440   445

Ile Ala Thr Gly Phe Ile Ala Asp His Pro His Leu Leu Gln Ala Pro
  450   455   460

Pro Ala Asp Asp Glu Gln Gly Arg Ile Leu Asp Tyr Leu Ala Asp Val
465   470   475   480

Thr Val Asn Lys Pro His Gly Val Arg Pro Lys Asp Val Ala Ala Pro
          485   490   495

Ile Asp Lys Leu Pro Asn Ile Lys Asp Leu Pro Leu Pro Arg Gly Ser
      500   505   510

Arg Asp Arg Leu Lys Gln Leu Gly Pro Ala Ala Phe Ala Arg Asp Leu
      515   520   525

Arg Glu Gln Asp Ala Leu Ala Val Thr Asp Thr Thr Phe Arg Asp Ala
      530   535   540

His Gln Ser Leu Leu Ala Thr Arg Val Arg Ser Phe Ala Leu Lys Pro
545   550   555   560

Ala Ala Glu Ala Val Ala Lys Leu Thr Pro Glu Leu Leu Ser Val Glu
          565   570   575

Ala Trp Gly Gly Ala Thr Tyr Asp Val Ala Met Arg Phe Leu Phe Glu
      580   585   590

Asp Pro Trp Asp Arg Leu Asp Glu Leu Arg Glu Ala Met Pro Asn Val
      595   600   605

Asn Ile Gln Met Leu Leu Arg Gly Arg Asn Thr Val Gly Tyr Thr Pro
    610   615   620

Tyr Pro Asp Ser Val Cys Arg Ala Phe Val Lys Glu Ala Ala Ser Ser
625   630   635   640

Gly Val Asp Ile Phe Arg Ile Phe Asp Ala Leu Asn Asp Val Ser Gln
          645   650   655

Met Arg Pro Ala Ile Asp Ala Val Leu Glu Thr Asn Thr Ala Val Ala
          660   665   670

Glu Val Ala Met Ala Tyr Ser Gly Asp Leu Ser Asp Pro Asn Glu Lys
      675   680   685

Leu Tyr Thr Leu Asp Tyr Tyr Leu Lys Met Ala Glu Glu Ile Val Lys
    690   695   700

Ser Gly Ala His Ile Leu Ala Ile Lys Asp Met Ala Gly Leu Leu Arg
705   710   715   720

Pro Ala Ala Val Thr Lys Leu Val Thr Ala Leu Arg Arg Glu Phe Asp
          725   730   735

Leu Pro Val His Val His Thr His Asp Thr Ala Gly Gly Gln Leu Ala
          740   745   750

Thr Tyr Phe Ala Ala Ala Gln Ala Gly Ala Asp Ala Val Asp Gly Ala
      755   760   765

Ser Ala Pro Leu Ser Gly Thr Thr Ser Gln Pro Ser Leu Ser Ala Ile
    770   775   780

Val Ala Ala Phe Ala His Thr Arg Arg Asp Thr Gly Leu Ser Leu Glu
785   790   795   800

Ala Val Ser Asp Leu Glu Pro Tyr Trp Glu Ala Val Arg Gly Leu Tyr
            805   810   815

Leu Pro Phe Glu Ser Gly Thr Pro Gly Pro Thr Gly Arg Val Tyr Arg
        820   825   830

His Glu Ile Pro Gly Gly Gln Leu Ser Asn Leu Arg Ala Gln Ala Thr
        835   840   845

Ala Leu Gly Leu Ala Asp Arg Phe Glu Leu Ile Glu Asp Asn Tyr Ala
    850   855   860 .

Ala Val Asn Glu Met Leu Gly Arg Pro Thr Lys Val Thr Pro Ser Ser
865   870   875   880

Lys Val Val Gly Asp Leu Ala Leu His Leu Val Gly Ala Gly Val Asp
            885   890   895

Pro Ala Asp Phe Ala Ala Asp Pro Gln Lys Tyr Asp Ile Pro Asp Ser
        900   905   910

Val Ile Ala Phe Leu Arg Gly Glu Leu Gly Asn Pro Pro Gly Gly Trp
        915   920   925

Pro Glu Pro Leu Arg Thr Arg Ala Leu Glu Gly Arg Ser Glu Gly Lys
    930   935   940

Ala Pro Leu Thr Glu Val Pro Glu Glu Glu Gln Ala His Leu Asp Ala
945   950   955   960

Asp Asp Ser Lys Glu Arg Arg Asn Ser Leu Asn Arg Leu Leu Phe Pro
            965   970   975

Lys Pro Thr Glu Glu Phe Leu Glu His Arg Arg Arg Phe Gly Asn Thr
        980   985   990

Ser Ala Leu Asp Asp Arg Glu Phe Phe Tyr Gly Leu Val Glu Gly Arg
    995   1000   1005

Glu Thr Leu Ile Arg Leu Pro Asp Val Arg Thr Pro Leu Leu Val
    1010   1015   1020

Arg Leu Asp Ala Ile Ser Glu Pro Asp Asp Lys Gly Met Arg Asn
    1025   1030   1035

Val Val Ala Asn Val Asn Gly Gln Ile Arg Pro Met Arg Val Arg
    1040   1045   1050

Asp Arg Ser Val Glu Ser Val Thr Ala Thr Ala Glu Lys Ala Asp
    1055   1060   1065

Ser Ser Asn Lys Gly His Val Ala Ala Pro Phe Ala Gly Val Val
    1070   1075   1080

Thr Val Thr Val Ala Glu Gly Asp Glu Val Lys Ala Gly Asp Ala
    1085   1090   1095

Val Ala Ile Ile Glu Ala Met Lys Met Glu Ala Thr Ile Thr Ala
    1100   1105   1110

Ser Val Asp Gly Lys Ile Asp Arg Val Val Val Pro Ala Ala Thr
    1115   1120   1125

Lys Val Glu Gly Gly Asp Leu Ile Val Val Val Ser
    1130   1135   1140